

# THE OVERSTRAND'S TURRET

## *Details of a Power-operated Device to Facilitate Accurate Gunnery*

**I**t was only two years ago that crowds stood open-mouthed round the New Types Park at the R.A.F. Display and watched a strange cylindrical structure in the nose of a new Boulton Paul Overstrand bomber twirling round and round under the urge of some hidden force, while the gunner within it did nothing but aim his Lewis gun in the direction in which he desired the turret to rotate. That was the first public presentation of the Boulton Paul mechanically operated gun turret, details of which have now been released.

The turret fitted to the Overstrand was developed by Boulton Paul Aircraft, Ltd. to meet the demand for the protection of the gunner from wind and cold, in order to enable him to use his weapon effectively at high air speeds and high altitudes. The device also relieves the gunner of the muscular effort of aiming the gun.

The turret consists of a cylinder with domed ends, largely covered with transparent material, mounted at its base in a bearing carried from a bracket built into the front fuselage frame and supported further by a special type of roller bearing which only partly surrounds the upper extremity of the cylindrical body, just below the upper cupola, but which, nevertheless, effectively supports the turret against loads in all directions.

### A "Balanced" Gunner

Within the turret is a pivoted gun arm, carrying a Lewis gun whose barrel projects through a vertical slot which extends over the whole depth of the turret, and allows the gun to be elevated over the entire range from vertically up to vertically down. The gunner is seated within the turret on a seat supported on a hydraulic ram, this ram being connected to a pair of smaller rams coupled to the elevating gun arm. The two sets of rams and the leverage of the second set about the gun-arm pivot are so arranged that the gunner's weight just balances that of the gun arm, the seat and gun arm moving in opposite directions.

With the gun at maximum elevation, the gunner's seat is at its normal position, giving the gunner a comfortable view up along the sights, while as the gun is depressed the gunner rises, until, with the gun at maximum depression he is again comfortably over his sights.

A valve in the connection between the two sets of hydraulic rams allows the gunner to lock seat and gun in any desired relative position, and an adjustment of the leverage of the rams coupled to the gun arm permits accurate control of the degree of balance between gunner and gun, to cover variations in his weight.

The gun is mounted on the elevating arm by a vertical pivot which permits it to be given a limited degree of training in azimuth. The possible degree of such movement is small and is opposed by a pair of spring-loaded plungers tending to centralise the gun. Movement under manual pressure by the gunner against the spring loading of these plungers operates on a pair of control valves which admit compressed air to a reversible pneumatic motor, causing this motor to start up in a direction depending on the direction in which the gun is pressed, and to run at a speed which increases with increase of such pressure. The motor is geared to the turret and causes it to rotate bodily in its bearings, training the gun in azimuth in response to the pressure exerted on the spade handle by the gunner. In this way rapid movement of the gun in both elevation and in azimuth follows upon the exertion by the gunner of very small muscular efforts.

The turret as a whole is capable of continuous rotation in either direction, but it is obvious that, unless the gun is elevated sufficiently to clear the top of the fuselage, the degree of such rotation which can be used is limited. Automatic stop devices



The neat installation of the Boulton Paul turret in the nose of an Overstrand medium bomber of No. 101 (B.) Squadron.

are therefore provided which interrupt the supply of compressed air to the motor before the gun fouls the body. These devices are controlled by the gun elevation, so that continuous rotation is possible with the gun elevated to fire over the top wings. Thus the field of fire is as large as is possible for a gun in the particular position without hitting some part of the aircraft itself.

In addition to being a gun position, the turret serves as a bomb aimer's station. To this end it is provided with an "openable" bomb aiming window to one side of the gun slot, and a locking device which serves to locate and to lock the turret with the bombing window and the bomb sight axes in correct alignment with the aircraft as a whole.

For bombing the gun is stowed at the maximum elevation possible, the seat being then in its lowest position; the occupant has ample room and is conveniently placed to operate the bomb sight.

The existence of an open gun slot some three to four inches wide extending from top to bottom of the turret has been found to produce surprisingly little draught internally. Even this can be suppressed when the gun is not in action by stowing the gun at the top of the turret and closing the slot by a Zipp-fastened strip of canvas.

### Central Heating

The turret is also provided with a hot air supply drawn from a heater muff on the engine exhaust pipes which is capable of providing a comfortable temperature under the worst operating conditions. All facilities are available for accurate bombing and accurate gunnery, including the features mentioned above and telephonic intercommunication with the other members of the crew.

Access to the turret is provided through a doorway into the front of the fuselage, this door, of course, being interlocked so that it can only be opened when the turret is correctly orientated relative to the aircraft body. An emergency exit, which can be used either for leaving by parachute or in the case of a crash, is provided by making the upper part of the dome easily detachable.

Power for operating the turret is provided by an engine-driven six-cylinder air compressor, which keeps a set of compressed air bottles of standard type charged to 200 lbs./sq. in. pressure. In the event of engine failure, the bottle capacity is sufficient to operate the turret for fifteen to twenty complete revolutions. The rate of rotation normally possible is about 12 r.p.m.

Boulton Paul Aircraft, Ltd. are actively engaged in the further development of power-operated gun mountings of various types, but it is not permissible at present to give any particulars of their more recent designs.

Photographs of details appear elsewhere in this issue.